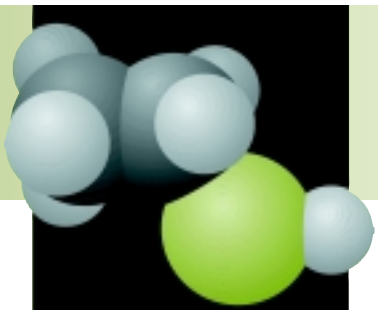
CHEMICALS

Project Fact Sheet



Pressure Swing Adsorption for Product Recovery

Benefits

- Potential to recover over 80,000 metric tons per year of hydrocarbons and save 336,000 standard cubic feet per day of natural gas from U.S. polyolefin plants
- Potential to recover approximately 330 million standard cubic feet per day of hydrogen from refinery offgas.
- Decreases NO_x, CO_2, and VOC emissions by recovering normally flared vent streams
- Reduces operating costs

Applications

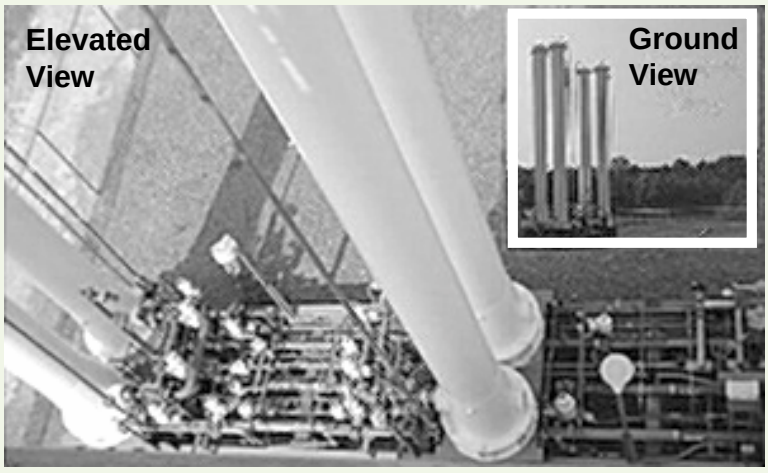
The development of a single unit PSA system capable of handling heavy hydrocarbons (C_4+) is applicable to both the chemical and refining industries. This new PSA technology will address polyolefin vent and refinery offgas streams and could be adapted to recover valuable products from other waste streams throughout the industry.

Highly selective pressure swing adsorption (PSA) technology recovers valuable components from waste streams

Recovery of hydrogen from refinery offgas for reuse as a higher value product or recovery of olefins from polyolefin plant vent gases are opportunities for providing increased productivity, energy savings and reduced waste. Pressure swing adsorption (PSA) is an energy-efficient and economical method for recovering these components in a single unit operation. In general, PSA systems are reliable and provide the capability for a high rate of recovery. However, the heavy hydrocarbons (C_4+), aromatics, and in some cases hydrogen sulfides, contained in refinery and polyolefin streams may limit conventional PSA adsorbents' regeneration capability. This potential limitation has raised concerns about the reliability of PSA systems, thus restricting the acceptance by the marketplace.

This project will focus on identifying existing adsorbents as well as developing new adsorbents and processes that are highly selective, yet chemically inert towards heavy hydrocarbons and the other potentially fouling components of refinery and polyolefin plant gas streams. These adsorbents and processes will allow reliable removal of heavy hydrocarbons within the PSA system. Adsorbent regeneration cycles and techniques will be evaluated to optimize performance. The research data obtained will be used to design, build and operate a field unit at a commercial facility. The PSA field unit will demonstrate the potential of the new system and adsorbents for recovering high-value products from waste streams.

Four Bed Pressure Swing Adsorption Unit



A recently constructed four bed pressure swing adsorption unit. One bed produces clean product gas by removing the hydrocarbon components from the feed gas while the other three beds are in various stages of regeneration.

Project Description

Goal: To develop and demonstrate innovative and cost-effective Pressure Swing Adsorption (PSA) adsorbents and systems to recover valuable components from polyolefin plant vent streams and refinery offgases.

The project team will work to identify or develop adsorbents that have no catalytic activity and that do not degrade with exposure to heavy hydrocarbons (C_4+), aromatics or hydrogen sulfide. Selected adsorbents will be pilot tested to develop process design parameters. The team will design, build and test a demonstration unit at an operating facility.

Progress and Milestones

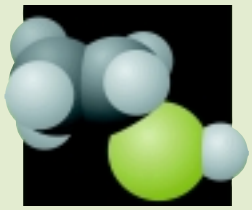
Project partners will identify, develop and characterize adsorbents and PSA compatibility. This will be followed by scaleup, design and field demonstration of the new PSA unit for olefin and hydrogen recovery.

Design and Demonstration of Olefin Recovery Process

- **Adsorbent Characterization & Stability** - Measure the equilibrium, kinetic and physical properties of commercial and novel variants of commercial adsorbents under the process conditions encountered during olefin recovery.
- **Pilot-Scale Process Development** - Conduct pilot test program to develop a process database, verify process models and provide a base line for full-scale process design.
- **Field Demonstration** - Design, build and install a PSA system. Operate for three months to accumulate performance and stability data.
- **Economic Analysis and Commercialization Plan** - Develop a commercialization plan based on the pilot-scale and field demonstration results for introducing this process to industry. Select and obtain demonstration partners.

Commercialization

PSA technology will initially be deployed by the demonstration partner(s). In parallel, the technical progress of this project would be reported in trade journals and through Air Products and Chemicals' marketing department to potential end-users.



Project Partners

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